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IS : 12143 - 1987

*Indian Standard*  
**CODE OF SAFETY FOR  
TETRACHLOROETHANE**

UDC 661.723.64 : 614.878

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

**Gr 3**

*February* 1988

**AMENDMENT NO. 1 DECEMBER 2006  
TO  
IS 12143 : 1987 CODE OF SAFETY FOR  
TETRACHLOROETHANE**

*(Page 4, clause 3.3.1)* — Insert the following at the end:

'Tetrachloroethane reacts chemically with fuming sulfuric acid and strong caustics. It attacks most plastics and rubber.'

(CHD 8)

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Reprography Unit, BIS, New Delhi, India

# *Indian Standard*

## CODE OF SAFETY FOR TETRACHLOROETHANE

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# ***Indian Standard***

## **CODE OF SAFETY FOR TETRACHLOROETHANE**

### **0. FOREWORD**

**0.1** This Indian Standard was adopted by the Bureau of Indian Standards on 14 August 1987, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

**0.2** Tetrachloroethane is used for metal washing and degreasing, and as an extraction solvent for oils and fats. It is also used for synthesis of trichloroethylene.

**0.3** In the preparation of this code of safety, considerable assistance has been taken from the following publications:

- a) Manual for Handling and Disposal with Toxicity and Hazardous Data. Published by International Technical Information Institute, Japan. 1981.
- b) Dangerous Properties of Industrial Materials, third edition. N. Trving Sax. Published by Reinhold Publishing Corporation, USA. 1957.

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### **1. SCOPE**

**1.1** This standard describes properties of tetrachloroethane, the nature of hazards associated with it and essential information on storage, handling, packaging, labelling, waste disposal, training and education to personnel, personal protective equipment and first-aid.

**1.1.1** This code, however, does not deal with the specifications for design of buildings, chemical engineering plants, storage vessels and equipment for operations control.

### **2. TERMINOLOGY**

**2.1** For the purpose of this standard, the definitions given in IS : 4155-1966\* shall be used.

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\*Glossary of terms relating to chemical and radiation hazards and hazardous chemicals.



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### 3. PROPERTIES

**3.1 General Information** — Tetrachloroethane is a colourless, heavy liquid. It is corrosive and has chloroform like odour. It is soluble in alcohol and ether and slightly soluble in water. It is most toxic amongst chlorinated hydrocarbons.

|                                |  |
|--------------------------------|--|
| <b>3.1.1 Common Name</b>       | Tetrachloroethane, Acetylene tetrachloride |
| <b>3.1.2 Chemical Name</b>     | 1, 1, 2, 2 — Tetrachloroethane             |
| <b>3.1.3 Empirical Formula</b> | $C_2H_2Cl_4$                               |
| <b>3.1.4 Molecular Formula</b> | $Cl_2CH-CHCl_2$                            |
| <b>3.1.5 Molecular Weight</b>  | 167.86                                     |

### 3.2 Physical Properties

|  |                   |
|--|-------------------|
| <b>3.2.1 Boiling Point</b>             | 146.5°C/760 mm Hg |
| <b>3.2.2 Melting Point</b>             | ( – ) 44°C        |
| <b>3.2.3 Specific Gravity (25/4°C)</b> | 1.86              |
| <b>3.2.4 Refractive Index, 25°C</b>    | 1.49419           |
| <b>3.2.5 Volatility</b>                | Low               |

### 3.3 Chemical Properties

**3.3.1 Reactivity** — Tetrachloroethane can be hydrolyzed with water to release hydrochloric acid. On heating with alkalies, it forms dichloroacetylene. It is important to avoid the use of aluminium and other light metals in handling tetrachloroethane.

**3.3.2 Light Sensitivity** — No.

**3.3.3 Flammability** — It is non-flammable.

### 3.4 Fire and Explosion Hazard Properties

**3.4.1** On heating with strong caustic, it forms explosive dichloroacetylene.

**3.4.2** Its vapours in air do not form explosive mixture.

**3.5 Corrosion Properties** — In presence of moisture, tetrachloroethane gradually decomposes with evolution of hydrochloric acid and corrodes

metals. When perfectly dry is relatively inert to most metals except zinc, aluminium, magnesium and alloys thereof.

## 4. HEALTH EFFECTS AND TOXICITY INFORMATION

### 4.1 General

TLV — 1 ppm (7mg/m<sup>3</sup>)

(TDL) — Oral-rat LD<sub>50</sub> : 200 mg/kg

**4.2 Route of Entry** — Inhalation, absorption through skin and eye contact.

### 4.3 Health Effects

**4.3.1 Inhalation** — It causes irritation of respiratory tract, headache, dizziness, extreme exhaustion, enlarged liver and jaundice, oliguria, hematuria, albuminuria, mental instability and drowsiness, paralysis and coma, cardiac irregularity, tremor, Lack of appetite, nausea and vomiting.

**4.3.1.1 Skin Contact** — Polyneuritis ( inflammation of nerves ) of fingers and toes. Other symptoms of inhalation.

**4.3.1.2 Eyes** — Conjunctivitis and dimness of sight

**4.3.2** It is absorbed quickly through skin but eliminated slowly. Therefore repeated exposures are dangerous. After severe exposure, effects on the central nervous system (CNS) may be present for months and years. Severe exposure may also effect the liver, kidneys and blood forming tissues.

## 5. PERSONAL PROTECTIVE EQUIPMENT

### 5.1 Personal Protection

**5.1.1** Protective equipment should include self-contained breathing apparatus or airline respirator. PVC or neoprene hand gloves and clothes to avoid contact with the liquid. Use of safety goggles or face shields to prevent splashing of the liquid into eyes is also recommended. All contaminated clothing should be washed and thoroughly dried before use.

**5.1.2** The use of appropriate gas mask is permissible in vapour concentration of less than 20 percent where there is no deficiency of atmospheric oxygen of exposure exceeding half an hour.

**5.1.3** Care should be exercised taking into account the fact that its vapours are heavier than air.

## 6. STORAGE, HANDLING, LABELLING AND TRANSPORTATION

**6.1 Storage** — Store in mild steel drums protected from moisture in a cool place. Storage under roof is preferable in all seasons. Area should be well ventilated.

**6.2 Handling** — While handling tetrachloroethane, wear safety goggles, gas mask and protective rubber clothing.

**6.3 Labelling** — Use of hazard/warning symbols in the plant area are strongly recommended.

**6.3.1** Cautionary labels, such as "Avoid Spillage," "Use Personal Protectives", "Avoid Skin Contact", "Avoid Inhaling Vapour" are recommended.

### **6.3.2** *Information on Labels*

- a) Name of chemical.
- b) Danger—vapour hazardous/toxic, and
- c) Avoid skin contact.

**6.4 Transport** — Follow code of symbols for labeling of dangerous goods as per Fig. 11 of IS : 1260 ( Part 1 )-1973\* and follow safety code for transport of dangerous goods as per Government regulations.

## 7. SPILLAGE/LEAKAGE AND WASTE DISPOSAL

### 7.1 Spills and Leakages

**7.1.1** For spills absorb with paper on other suitable absorbent. Get rid of tetrachloroethane by evaporation in a hood or by burning.

**7.1.2** If container leakage cannot be stopped, tetrachloroethane should be transferred to another suitable container. Ample ventilation should be provided for escaping vapours. During transfer, wear protective equipment.

**7.1.3** In the event of a leak in tank car which can not be repaired by simple adjustment or tightening the fittings the suppliers help should be sought.

**7.1.4** Clothings wet with tetrachloroethane should be removed immediately and the body washed thoroughly with water. The liquid may have defatting of skin.

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\*Pictorial markings for handling and labelling of goods: Part 1 Dangerous goods (*first revision* ).

## **7.2 Waste Disposal**

**7.2.1** All relevant regulations of local and State authorities for prevention and control of pollution should be observed.

**7.2.2** Waste should be collected and recovered by distillation.

**7.2.3** If the waste is not recoverable, collect, mix it with combustible solvent and incinerate in a furnace. Flue gases should be scrubbed in dilute caustic solution to avoid release of toxic vapours/fumes.

## **8. FIRE PREVENTION AND FIRE FIGHTING**

**8.1** Tetrachloroethane is not combustible. However, it should be stored away from heat and fire. In a fire situation, tetrachloroethane can be hazardous due to its harmful vapours. Carbon dioxide, dry chemical powder or foam can be used for fire fighting when this chemical is involved.

## **9. TRAINING AND HEALTH MONITORING**

**9.1 Training and Education** — Persons handling tetrachloroethane should be trained such that they can carry out their job safely, effectively and knowledgeably. They should be appraised of the use of protective equipment and minimize hazards involved in handling of tetrachloroethane. All workers should be familiar with the location of safety showers, alarm boxes, emergency ventilation systems, first aid boxes, artificial respiration methods. Proper training and education of employees will minimize hazards involving tetrachloroethane.

**9.2 Health Monitoring** — This is required for employees who would be exposed to tetrachloroethane. Individuals having following conditions should not be exposed to tetrachloroethane.

- a) Diseases of central nervous system,
- b) Alcoholism,
- c) Diseases of kidney or liver, and
- d) Anaemia.

The workers should undergo medical examination at least once a year including complete blood count and functioning of liver and kidney.

**9.1.1** The records of medical examination should be maintained regularly. A specific treatment given for any deficiency should be recorded.

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## **10. FIRST AID**

**10.1** Most important is quick removal from exposure. Wash contaminated areas with soap and water. In case of contact with eyes, wash with water and seek medical attention.

**10.2** If swallowed, induce vomiting and seek medical advice. If exposed to vapours and not breathing, remove to fresh air and give artificial respiration. In case of difficulty, administer oxygen. Call a physician.

*Caution:* Nothing should be given by mouth to an unconscious person.

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INTERNATIONAL SYSTEM OF UNITS ( SI UNITS )

Base Units

| QUANTITY                  | UNIT     | SYMBOL |
|---------------------------|----------|--------|
| Length                    | metre    | m      |
| Mass                      | kilogram | kg     |
| Time                      | second   | s      |
| Electric current          | ampere   | A      |
| Thermodynamic temperature | kelvin   | K      |
| Luminous intensity        | candela  | cd     |
| Amount of substance       | mole     | mol    |

Supplementary Units

| QUANTITY    | UNIT      | SYMBOL |
|-------------|-----------|--------|
| Plane angle | radian    | rad    |
| Solid angle | steradian | sr     |

Derived Units

| QUANTITY             | UNIT    | SYMBOL | DEFINITION                       |
|----------------------|---------|--------|----------------------------------|
| Force                | newton  | N      | 1 N = 1 kg.m/s <sup>2</sup>      |
| Energy               | joule   | J      | 1 J = 1 N.m                      |
| Power                | watt    | W      | 1 W = 1 J/s                      |
| Flux                 | weber   | Wb     | 1 Wb = 1 V.s                     |
| Flux density         | tesla   | T      | 1 T = 1 Wb/m <sup>2</sup>        |
| Frequency            | hertz   | Hz     | 1 Hz = 1 C/S ( S <sup>-1</sup> ) |
| Electric conductance | siemens | S      | 1 S = 1 A/V                      |
| Electromotive force  | volt    | V      | 1 V = 1 W/A                      |
| Pressure, stress     | pascal  | Pa     | 1 Pa = 1 N/m <sup>2</sup>        |

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